For answer script - EVERY answer sheet MUST include (a) full student name, (b) student number, (c) subject code, (d) subject group and (e) page number.

Name:	Chung Lok Ming	Student No.:	20008848A
Subject Code	SEHH2239	Subject Lecture Group:	
Page No.:	**1**	Total no. of pages:	**13**

Declaration of Original Work

By submitting the answer script of this assignment to the subject lecturer through Moodle Centralized Group, you hereby declare that the work in the answer sheet is completely your own work. No part of the answer sheet is taken from other people's work without giving them credit. All references have been clearly cited.

You understand that an infringement of this declaration leaves you subject to disciplinary actions such as mark deduction, disqualification or even expulsion by the College.

If necessary, students may be invited to provide more information on their submission.

(Please refer to the relevant section(s) on plagiarism of the Student Handbook.)

Instructions to Students:

1. Please refer to assignment specification for the submission method
2. Show all your work clearly and neatly. Marks will be deducted for untidy work.

Answer ALL questions.

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Answer for Question 1

A= 08 b=88 c=84 d=48

a) + * a b *c d -> +*8 88 * 84 48

b) a*b + c*d -> 8*88 + 84*48

c) 4736

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Answer for Question 2

a)

```
#q2a
class MyMailQue:
    def __init__(self) :
        self.mails = []
        self.size = 0

    def enqueue(self, data):
        self.mails.append(data)
        self.size += 1

    def dequeue(self):
        if self.size > 1:
            popped = self.mails[0]
            self.mails = self.mails[1:]
            self.size -= 1
            return popped
        elif self.size == 1:
            popped = self.mails[0]
            self.mails = []
            self.size -= 1
            return popped
        else:
            return None

    def display(self):
        for i in self.mails:
            print(i)
```

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b)

```
class MailBox:
    def __init__(self):
        self.mailbox = {
            'example': MyMailQue(),
        }

    def createMailBox(self, addr) :
        try:
            self.mailbox[addr] = MyMailQue()
        except Exception:
            print('Error')


    def send(self, sender, receiver, mailbody) :
        if self.mailbox.get(receiver):
            tuple_mail = (sender, mailbody)
            self.mailbox.get(receiver).enqueue(tuple_mail)
        else:
            print('Can\'t sent')

    def receive(self, addr) :
        if self.mailbox.get(addr):
            Queue = self.mailbox.get(addr)
            return Queue.dequeue()
        else:
            print('Cant receive')
```

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c)

```
57  Mailserver = MailBox()
58  Mailserver.createMailBox("mymail")
59  Mailserver.createMailBox("classmateMail")
60
61  Mailserver.send("mymail", "classmateMail", "Hello ! How are you ?" )
62  Mailserver.send("mymail", "classmateMail", "Please prepare assignment for Data structure ")
63  Mailserver.send("classmateMail", "mymail", "I got your assignment and will prepare it ! ")
64  Mailserver.send("mymail", "classmateMail", "Thanks you and see you later ! ")
65
66  mail = Mailserver.receive("mymail")
67  print("My receive mail :" + str(mail) )
68
69  mail = Mailserver.receive("classmateMail")
70  print("My classmate receive mail :" + str(mail) )
71
72
73  #test case 1
74  Test1Server = MailBox()
75  Test1Server.createMailBox('test1')
76  Test1Server.createMailBox('test2')
77
78  Test1Server.send('test1', 'test2', "Email 1 for testing")
79
80  mail = Test1Server.receive('test2')
81  print("test2 receive mail :" + str(mail) )
82
83  #test case 2
84  Test2Server = MailBox()
85  Test2Server.createMailBox('test3')
86  mail = Test2Server.receive('test3')
87  print("test3 receive mail :" + str(mail) )
88
89  #test case 3
90  Test3Server = MailBox()
91  mail = Test3Server.receive('test4')
92  print("test4 receive mail :" + str(mail) )
```

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Answer for Question 3

8 88 84 48 80 840 880

a=8
b=88
c=84
d=48
e=80
f=840
g=880

a)

i)

```
class Node:
    def __init__(self, data):
        self.data = data
        self.left_node = None
        self.right_node = None
```

ii)

```
106     def searchPath(self, root):
107         self.store.append(root)
108         if root.data == 'end':
109             for item in self.store:
110                 if item.data == "end":
111                     print(f"{item.data}")
112                 else:
113                     print(f"{item.data}->", end="")
114             return
115         else:
116             if root.left_node:
117                 self.searchPath(root.left_node)
118             elif root.right_node:
119                 self.searchPath(root.right_node)
```

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b)

```
def searchAllPath(self, root):
    if root is None:
        return

    self.store.append(root)
    if root.left_node or root.right_node:
        self.searchAllPath(root.left_node)
        self.searchAllPath(root.right_node)
    else:
        weight = 0
        for i in self.store:
            if i.data == "end":
                print(f'{i.data}', end='')
                print(f'\t{weight}')
            else:
                print(f"{i.data}->", end='')
                if i.data != 'start':
                    weight += i.data

    self.store.pop()
```

c)

```
143         def searchPathByWeight(self, root, end):
144             if root is None:
145                 return
146 
147             self.store.append(root)
148             if root.left_node is None and root.right_node is None:
149                 weight = 0
150                 for i in self.store:
151                     if i.data == "end":
152                         print(f'{i.data}', end='')
153                         print(f'\t{weight}')
154                     else:
155                         print(f"{i.data}->", end='')
156                         if i.data != 'start':
157                             weight += i.data
158 
159             if root.left_node and root.right_node:
160                 if root.left_node.data < root.right_node.data:
161                     self.searchPathByWeight(root.left_node,end)
162                 else:
163                     self.searchPathByWeight(root.right_node,end)
164 
165             self.store.pop()
```

d)

advantage of searchAllPath must be able to choose a shortest path by listing all the path. And for the advantage of searchpathbyweight time complexity is lower. And for the disadvantage of searchAllPath is that the time complexity will need a longer time to run all the path. As for the disadvantages searchpathbyweight may not find the shortest path since it is dependent on the next loop and won't take another path.

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```
#test 1
Start_node = Node('start')

a=8
b=88
c=84
d=48
e=80
f=840
g=880

Start_node = Node('start')
b_node = Node(b)
d_node = Node(d)
e_node = Node(e)
End_node = Node('end')

Start_node.left_node = b_node
b_node.left_node = d_node
b_node.right_node = e_node
d_node.right_node = End_node
e_node.left_node = End_node


mypath = Path()
mypath.searchPath(Start_node)

print('mypath.searchAllPath: ')
mypath.store = []
mypath.searchAllPath(Start_node)

print('mypath.searchPathByWeight')
mypath.store = []
mypath.searchPathByWeight(Start_node, End_no


start = Node('start')
a_node = Node(a)
b_node = Node(b)
b2 = Node(b)
c_node = Node(c)
c2 = Node(c)
d_node = Node(d)
d2 = Node(d)
e_node = Node(e)
e2 = Node(e)
f_node = Node(f)
f2 = Node(f)
g_node = Node(g)
end = Node('end')

start.left_node = b_node
start.right_node = c_node

b_node.left_node = d_node
b_node.right_node = e2

c_node.left_node = f2
c_node.right_node = g_node

d_node.left_node = f_node
d_node.right_node = e_node

e2.right_node = d2

f2.right_node = c2
g_node.left_node = b2
g_node.right_node = a_node

f_node.right_node = end
e_node.right_node = end
d2.right_node = end
c2.left_node = end
b2.left_node = end
a_node.left_node = end

mypath2 = Path()
print('mypath2')
mypath2.searchAllPath(start)

mypath2.store = []
print('mypath2')
mypath2.searchPathByWeight(start, end)

nodeStart = Node('start')

node6915 = Node(6915)
node300 = Node(300)
node59 = Node(59)
node31 = Node(31)
node21 = Node(21)
node12 = Node(12)
node45 = Node(45)
node786 = Node(786)
node86 = Node(86)
node68 = Node(68)
node88 = Node(88)
node48 = Node(48)
node689 = Node(689)
node777 = Node(777)
node1 = Node(1)
node996 = Node(996)
node8964 = Node(8964)
node101 = Node(101)
node911 = Node(911)
node899 = Node(899)
node517 = Node(517)
node7 = Node(7)
node167 = Node(167)
node169 = Node(169)
node612 = Node(612)
node831 = Node(831)
node721 = Node(721)
node609 = Node(609)
node107 = Node(107)
node1911 = Node(1911)
node1001 = Node(1001)

nodeEnd = Node('end')

nodeStart.left_node = node6915
nodeStart.right_node = node300

node6915.left_node = node59
node6915.right_node = node31

node59.left_node = node45
node59.right_node = node786

node45.left_node = node689
node45.right_node = node777
```

```
299  node689.left_node = node101
300  node689.right_node = node911
301
302  node31.left_node = node86
303
304  node86.left_node = node1
305
306  node1.left_node = node899
307  node1.right_node = node517
308
309  node899.left_node = node612
310  node899.right_node = node831
311
312  node612.left_node = node107
313
314  node107.left_node = node1911
315  node107.right_node = node1001
316
317  node517.left_node = node721
318  node517.right_node = node609
319
320  node300.left_node = node21
321  node300.right_node = node12
322
323  node21.left_node = node68
324  node21.right_node = node88
325
326  node68.right_node = node996
327
328  node996.right_node = node7
329
330  node12.right_node = node48
331
332  node48.left_node = node8964
333
334  node8964.left_node = node167
335  node8964.right_node = node169
336
337  node101.left_node = nodeEnd
338  node911.left_node = nodeEnd
339  node1911.left_node = nodeEnd
340  node1001.left_node = nodeEnd
341  node831.left_node = nodeEnd
342  node721.left_node = nodeEnd
343  node609.left_node = nodeEnd
344  node7.left_node = nodeEnd
345  node167.left_node = nodeEnd
346  node169.left_node = nodeEnd
347  node88.left_node = nodeEnd
348  node777.left_node = nodeEnd
349  node786.left_node = nodeEnd
350
351  mypath3 = Path()
352  print('mypath3')
353  mypath3.searchAllPath(nodeStart)
354
355  mypath3.store = []
356  print('mypath3')
357  mypath3.searchPathByWeight(nodeStart, nodeEnd)
```

```
359  #test 2
360  node_start = Node('start')
361  node_end = Node('end')
362
363  node_1 = Node(1)
364  node_2 = Node(2)
365  node_3 = Node(3)
366  node_4 = Node(4)
367  node_5 = Node(5)
368  node_6 = Node(6)
369  node_7 = Node(7)
370  node_8 = Node(8)
371  node_9 = Node(9)
372  node_10 = Node(10)
373  node_11 = Node(11)
374  node_12 = Node(12)
375  node_13 = Node(13)
376  node_14 = Node(14)
377  node_15 = Node(15)
378  node_16 = Node(16)
379  node_17 = Node(17)
380  node_18 = Node(18)
381  node_19 = Node(19)
382  node_20 = Node(20)
383  node_21 = Node(21)
384  node_22 = Node(22)
385  node_23 = Node(23)
386  node_24 = Node(24)
387  node_25 = Node(25)
388  node_26 = Node(26)
389  node_27 = Node(27)
390  node_28 = Node(28)
391  node_29 = Node(29)
392  node_30 = Node(30)
393  node_31 = Node(31)
394
395  node_start.left_node = node_1
396  node_start.right_node = node_2
397
398  node_1.left_node = node_3
399  node_1.right_node = node_4
400
401  node_3.left_node = node_7
402  node_3.right_node = node_8
403
404  node_7.left_node = node_15
405  node_7.right_node = node_16
406
407  node_8.left_node = node_17
408  node_8.right_node = node_18
409
410  node_4.left_node = node_9
411  node_4.right_node = node_10
412
413  node_9.left_node = node_19
414  node_9.right_node = node_20
415
416  node_10.right_node = node_21
417
418  node_2.left_node = node_5
419  node_2.right_node = node_6
420
421  node_5.left_node = node_11
422  node_5.right_node = node_12
423
424  node_11.left_node = node_22
```

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```
426    node_12.right_node = node_23
427
428    node_6.left_node = node_13
429    node_6.right_node = node_14
430
431    node_13.left_node = node_24
432
433    node_14.left_node = node_25
434    node_14.right_node = node_26
435
436    node_26.left_node = node_27
437    node_26.right_node = node_28
438
439    node_27.left_node = node_29
440    node_27.right_node = node_30
441
442    node_28.right_node = node_31
443
444    node_15.right_node = node_end
445    node_16.right_node = node_end
446    node_17.right_node = node_end
447    node_18.right_node = node_end
448    node_19.right_node = node_end
449    node_20.right_node = node_end
450    node_21.right_node = node_end
451    node_22.left_node = node_end
452    node_23.left_node = node_end
453    node_24.left_node = node_end
454    node_25.left_node = node_end
455    node_29.left_node = node_end
456    node_30.left_node = node_end
457    node_31.left_node = node_end
458
459    mypath4 = Path()
460    print('mypath4')
461    mypath4.searchAllPath(node_start)
462
463    mypath4.store = []
464    print('mypath4')
465    mypath4.searchPathByWeight(node_start, node_end)
466
```

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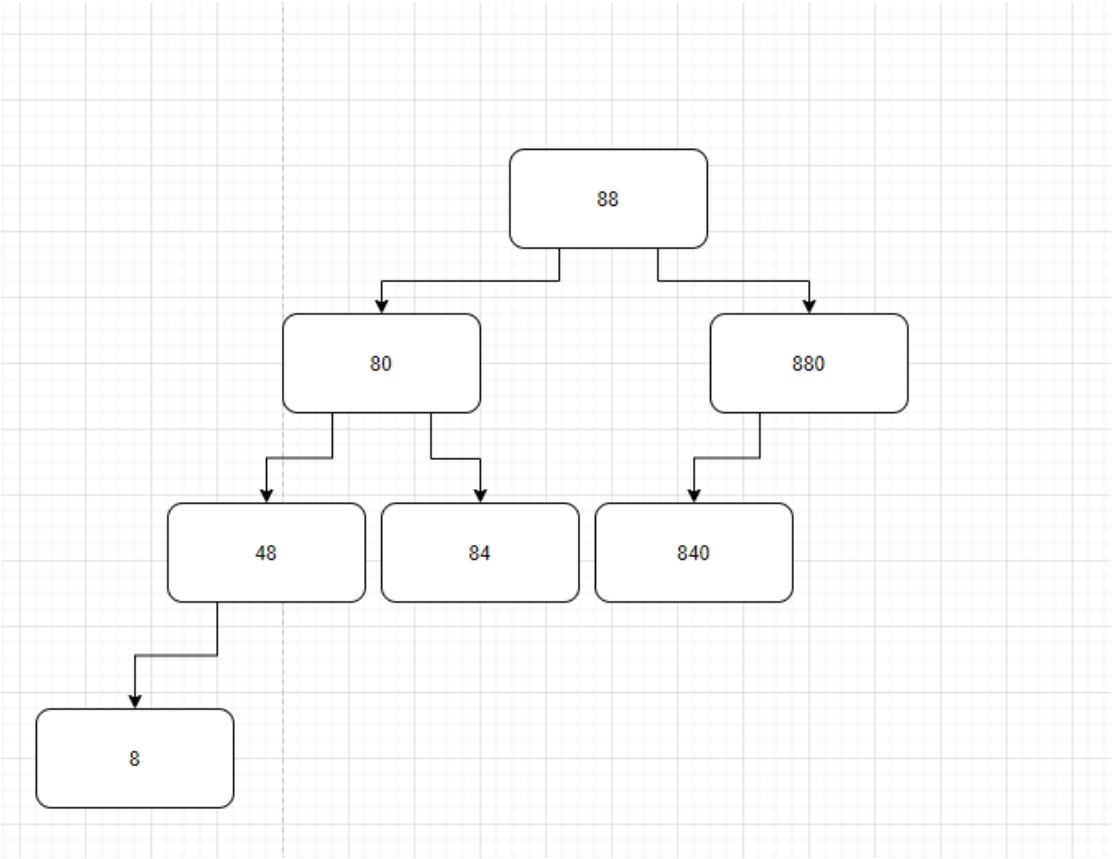
Answer for Question 4

A)



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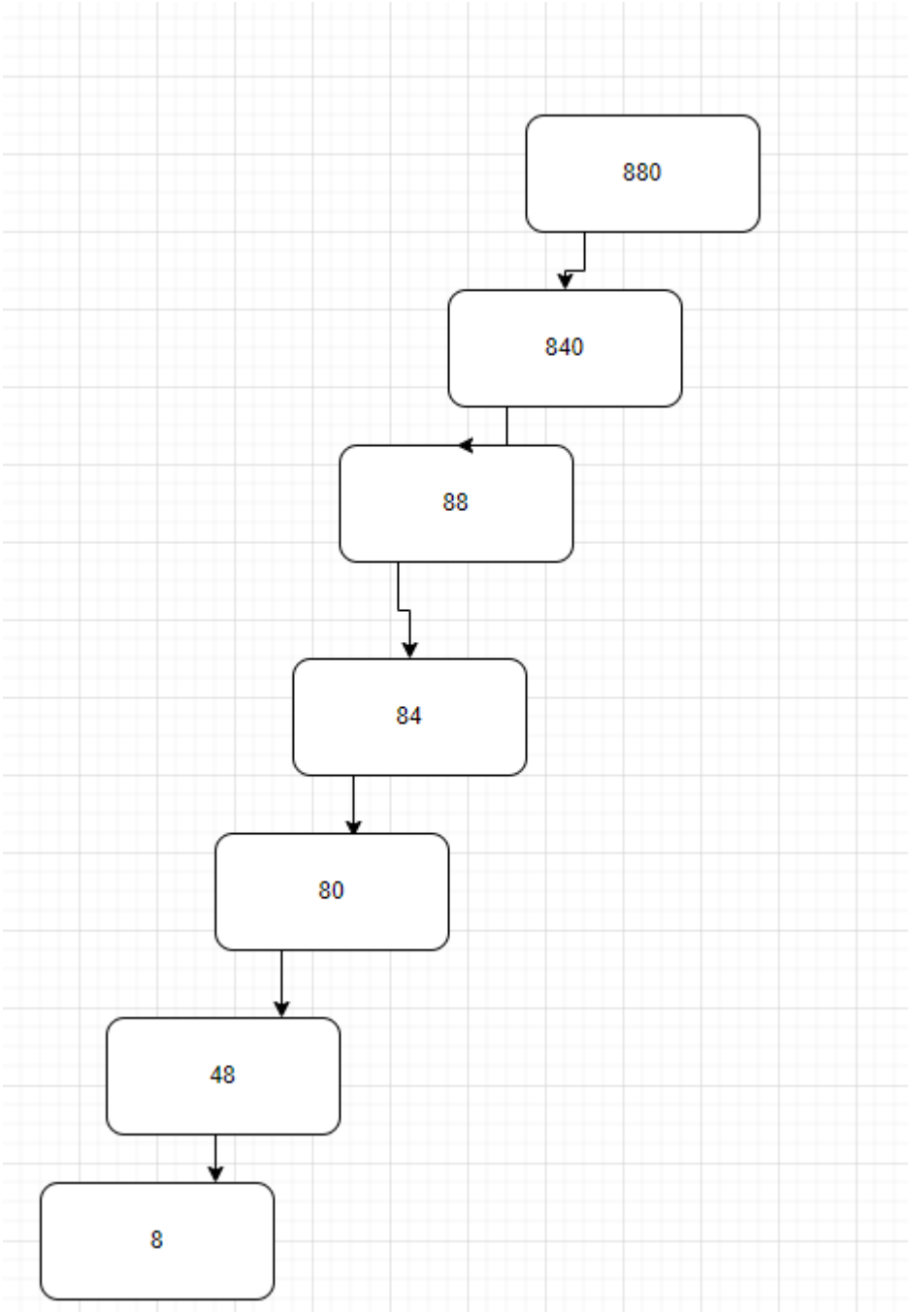
b)



C)88, 80, 880, 48, 84, 840, 8